

tinuous layer around the earth, nor is there any reason to suppose they should do so on Venus. Hence, if one of the clear spaces should happen to be in the right position, we should see through the gap, and the horn would be absent or broken.

Moreover it may be assumed that the planet is diversified by mountains and valleys like our own, and that these are probably of similar stature and depth.

When the great air-currents flow over such features, up and down movements are produced, which react upon any cloud zones above, destroying the clouds by a descent in one place, creating them or throwing them up to an abnormal height by an ascent elsewhere.

We can thus explain irregular or even periodic appearances of projections of the bright surface, or the occurrence of dark spaces in it, by attributing them to the passage of the cloud-laden air over an uneven surface beneath. Projecting points of light may well be thrown up to very great altitudes without needing to suppose mountains so vast that they would flatten out under their own weight.

4. The acceleration of phase in eastern elongation is commonly observed to vary from four to eight days—dichotomy, or any special phase, being so much earlier than the theoretical time.

This can only mean that the surface along the sunrise terminator is not at right angles to the planet's radius, but that it slopes upward toward the sun, and that the slope is steepest in the equatorial regions, and diminishes toward the poles.

But this is exactly how the upper surface of a shell of rising convection clouds should rise, and the fact alone is an almost conclusive proof that the cloud theory is right.

The phenomenon is not limited to dichotomy, but can be noticed at any time not far removed from greatest elongation.

The variation of the acceleration would imply a variation in the slope such as would be a natural consequence of changes in the underlying surface due to the slow rotation relative to the sun which has been postulated as essential to the permanent maintenance of the clouds.

5. The retardation of phase in western elongation is rather more pronounced. It can be explained as due to an even greater slope of the mean surface of the clouds, due to the collapse of the rising currents and breaking down of the clouds toward sunset. On the earth the fall of the cloud levels in the evening is distinctly more rapid than their morning rise. The fact may be regarded as a proof confirmatory of the last.

6. The shading off of the terminator and,

7. The variable contour of the terminator would both be the natural result of variations in the height to which the clouds had reached in consequence of differences in the nature, and therefore temperature or moisture of the surface beneath.

8. The smaller luminosity of the neighborhood of the terminator.

Apart from the glittering margin, which has been attributed to the cirrus veil, and apart from any definite darkening of a particular region, this is perhaps the most obvious feature of the planet.

At the limb we see only the shining cirrus. Elsewhere we look through it onto the summits of the convection clouds. If, as appears to be almost certain, the individual clouds have on the whole a roughly pyramidal or pillared contour like our cumulus and alto-cumulus castellatus, the body of the planet would be brightest near the limb, where only the tips of the clouds would be seen. On passing from the limb toward the center of the disk, we should see farther and farther into the shadows between them, and the proportion of shade should increase as the sun's rays become more oblique.

9. The presence of a faint band of shade, approximately parallel to, but at some distance from, the terminator.

This can nearly always be seen. It is not sharply contoured, but broad and ill-defined. Still a graduated shade, such as a

neutral tint wedge, will generally bring it out. It is best seen in eastern elongation when the planet is near dichotomy, or approaching its maximum brilliancy. It varies from time to time in breadth and depth of shade, but always occupies the same position relative to the terminator. It can not apparently be followed into the shining ring near the limb. It has been described by M. Antoniadi in the *Monthly Notices of the Royal Astronomical Society* for March, 1898, and its appearance is shown in Chart IX, figs. 4 and 5, which are, of course, on different scales.

Surely this is a high-pressure ring, darker than the rest because we see deeper into it, and the spaces between the clouds are larger. It is much less pronounced in western elongation, as we should expect should be the case from the difference between the temperature gradients toward sunrise and sunset.

10. The mottling or granulation of the surface, the appearance of dark or bright spots moving over the terminator, and the occurrence of bright points beyond it, are all phenomena which should be visible, and receive obvious explanations.

11. The ring of light seen at inferior conjunction, and usually attributed to atmospheric refraction, would more probably be nothing but the edge of the illuminated shell of cirrus. This stratum would, everywhere around the terminator, be several miles above the clouds, and perhaps 10 or 20 miles above the actual surface of the planet. Mere refraction ought to give a ring of colored light, yellow, or even red. But if the lower air is, as has been supposed, blocked by heavy convection clouds, all colored rays would be stopped, while the high cirrus would shine with the silvery light we see.

At such altitudes atmospheric refraction would be almost negligible, and a calculation based upon the position in which the circle is complete would give the height at which these delicate structures float, if only we knew how much to allow for that rise of the lower clouds near the terminator to which we have attributed the error of phase.

The phenomenon, then, may be regarded as only another aspect of the same fact which also explains the prolongation of the cusps.

Finally, if we suppose that the convection clouds do not form a continuous sheet, but are distributed broadcast with clear intervals for the descending partial currents which should accompany them, it becomes easy to believe that under suitable circumstances and with sufficiently powerful optical means, it may sometimes be possible to penetrate the veil, and see at least some of the most salient features of the planet's actual surface. On the other hand, the underlying surface must react upon the clouds above, and it may well be that those sharply defined markings which have been recorded are nothing more than a result marked out upon the veil by the features hidden beneath.

#### THE MOON BLAMELESS.

We print in full the following letter to the *New York Herald* of May 31, 1909, from the prominent and popular French astronomer, Camille Flammarion, as an influential contribution to the constant warfare between superstition and truth. While written particularly for the wine-growing districts of France, every word applies with equal force to the corresponding districts of this country. Even the general farmer would do well to consider the application of these simple and rational explanations to many of his problems and catastrophes.—*C. A. jr.*

OBSERVATORY OF JUVISY,  
PARIS, FRANCE, May 11, 1909.

TO THE EDITOR OF THE HERALD:

The April moon again is astir with its peculiar influences. Radiant, warm afternoons, alluring as a tropical day almost, have been succeeded by nights quite as radiant, but as cold as in winter. At the end of April and the beginning of May we have been blessed with spring during the

day, followed by winter at night. From a medium temperature of 20°C while the sun shone we have experienced a fall of 9° or 10°, and the maximum of 25° has been followed by a minimum many degrees under zero in the nocturnal hours. Congestion in many cases has been caused by the heat at midday, and, on the other hand, in as many instances by the cold of midnight.

In every district where fruit is grown, and especially in the vine country, serious damage has been done by the unseasonable frost. In the champagne country the thermometer registered 5°C below zero during the first nights of May and the vineyards suffered severely. Those of Touraine and Anjou also were damaged, while from Bourgogne and from all points in the South of France we hear the same chorus of lamentation. Particularly malign in its influence this year, the April moon has scored innumerable victims in the vegetable world. The loss is estimated at many millions.

#### POOR MOON.

Poor moon! It will be difficult indeed to exonerate it after such an indictment. Yet is it more culpable, really, than its accusers?

As a matter of fact, what is the April moon? Generally, the definition that I gave a long time ago has been adopted; i. e., it is the moon which rises after Easter.

I gave this definition in consonance with the popular idea, contrary to the dictum of the Annual of the Bureau of Longitudes, because it is the only one which is acceptable. The definition of the Annual is, in effect, this:

"The name April moon is given to the moon which rises in its first quarter in April and is full either at the end of the month or, more ordinarily, in the early part of May."

Now the moon may rise in April, for instance, on the 1st, 2d, or 3d and be full neither at the end of the month nor in the beginning of May, for it would be a full moon the 15th, 16th, or 17th. Such a definition as that quoted is, therefore, not only not correct, but it implies a contradiction, and it may easily be seen what a degree of uncertainty and confusion may arise from it. In 1905 it is noted that the April moon appeared April 4, finishing its course May 4. This is in contradiction to the definition.

If any definition is to be held free from popular prejudice it certainly must be in harmony with its own terms. Gardeners, horticulturists, and all cultivators of the soil are imbued with this prejudice, because they fear the frosts of the last half of April and of the first two weeks of May. These are for them the most critical periods, which they believe are administered by the disastrous April moon and which, according to this definition, they have long associated with the feast of Easter. This festival is determined for the Sunday following the first full moon after March 21 (the spring equinox). Easter can not come before March 22, and the new moon following can not rise before April 5. In this definition of the April moon this lunation begins at its very earliest only on April 5 and ends on May 5, never beginning April 4, 3, 2, or 1. Yet generally, the full moon rises at the end of April or in the first days of May. When Easter is late (its date varies between March 22 and April 25), the April moon appears in May. Note particularly that Easter is determined and its date fixed by astronomy.

This year, 1909, the April moon appeared April 20 and was gone May 19. This lunation, so much dreaded, is not designed to arouse our fears, but it serves rather as a convenient point from which to contemplate a characteristic time of the year, that in which takes place the struggle of spring to overcome the last onslaughts of winter. *It is the change of seasons that is alone responsible for damage to vegetation, and every year it is the same so far as this phase of the year is concerned.*

#### TEMPERATURES ARE DIFFERENT.

If the night is clear there is a great deal of radiation from the earth into space, whence there results a sensible lowering of the temperature of the ground reaching many degrees below zero (centigrade), while the ambient air is maintained at a temperature some degrees above. It has been proved that objects can acquire in the nocturnal hours a temperature differing from that of the atmosphere which envelopes them. For example, if you suspend in the air in the evening small balls of cotton you will often find that their temperature is 6°, 7°, and even 8°C below that of the surrounding atmosphere. Vegetable growth is subject to the same effects. Thus a plant may be frozen hard while the thermometer hanging near by indicates a temperature much above 0°C.

When it is cloudy this phenomenon does not occur. The temperature of the atmosphere, the earth, plants, etc., remains the same. The clouds form a screen or veil and prevent the heat stored in the ground during the day from escaping and ascending toward the celestial vault at night. On the contrary, if no obstacle be opposed to it the nocturnal radiation dissipates the heat and the temperature of the ground is lowered rapidly. Soon the frost seizes in its cruel grip the plants that are still frail, the too delicate flowers and the young shoots on tree and shrub; the watery juices, which are very abundant in newly formed vegetable tissues, become frozen, are enlarged in volume and burst the receptacle in which they are contained. In the morning the solar rays caress the flowers and the buds mortally hurt by the cold of the night, giving them a pale yellow hue, which precedes their final dissolution in a very few days. The result would be the same if the moon did not exist. This is so true that sometimes a very simple precaution only is necessary to save the

young cultures during this disastrous lunation; a veil of mist, a cloud of smoke, or even a little sheet of paper may serve as protection against the cold, perhaps averting a heavy loss.

To resume, let us say that the destruction of vegetation takes place when the atmosphere is transparent and the nocturnal radiation is intense. It is under the same circumstances, that is, when the heavens are serene and pure, that the moon sheds her white light upon the earth. But the moon is wholly innocent of the mischief that is attributed to her influence.

Moreover, the great thermometric variations that are observed, especially at this season of the year, attract our attention principally because of their grievous results. Nevertheless, such variations are to be noticed quite as much throughout the year. Ancient proverbs must not be taken too literally. For example, these three days, May 11, 12, and 13 are known by the names of the "saints of the ice," Saint Marmentius, Saint Pancras, and Saint Gervais. Now these saints of the ice are no more existent than the April moon, and the dates mentioned exhibit cold or warmth indifferently without any regularity. Neither in the one case or the other is there the least sign of an astronomical phenomenon.—*Camille Flammarion.*

#### SCIENTIFIC TRESPASS.

In his admirable address<sup>1</sup> on Earthquakes before the American Association of Geographers, Dr. G. K. Gilbert, as geologist, offered the following remarks, which apply equally well to meteorologists.

You are not to infer that an apology is made because I trespass on fields to which I have no title, for I am an advocate of the principle of scientific trespass. The specialist who forever stays at home and digs and delves within his private inclosure has all the advantages of intensive cultivation—except one; and the thing he misses is cross-fertilization. Trespass is one of the ways of securing cross-fertilization for his own crops and of carrying cross-fertilization to the paddock he invades. Hypotheses, the trial theories which compete for development into final theories, spring by the principle of analogy from earlier and successful theories, and the broader the investigator's knowledge of explanatory science the greater his opportunity to discover hypotheses that may be applied to his own problems. Progress is ever through the interaction of the sciences one on another; and scientific trespass is one of the profitable modes of interaction. The trespasser brings with him a mental attitude and a mental equipment which are new to the subject, and whether or no the idea he contributes eventually "makes good," its contribution creates a new category for observation and opens a new avenue of inquiry. And he carries back with him the pollen of new ideas.

#### WHAT IS THE CHINOOK WIND?

"The history of words is the history of the nation." The truth of this quotation from an early philologist is well exemplified by the following paragraph quoted from the Portland Oregonian:

In its present acceptance a "chinook" is the equatorial trade wind that blows during the winter months from the southwest and, laden with moisture, strikes the Pacific coast from the northern boundary of California to the Alaskan Archipelago. It is now the local name for the soft, balmy, south wind.

But it is a misnomer. In early days in Oregon, and even as late as the early seventies, our summer wind from the northwest was called a "chinook," so named because it blew into the Willamette Valley from the coast region inhabited by the Chinook Indians north of the entrance of the Columbia. Among the pioneers and their descendants a chinook wind was a "clearing up" wind. Now it signifies precisely the opposite, i. e., a wind from the south followed by rain.

Within the past twenty-five years the word has been grafted into the speech and the written language of the vast territory east of the Cascade Mountains, and circulates freely throughout Wyoming. It has been carried into western Nebraska. In recent years it has crept into Boston newspapers with local application. Any soft, balmy wind that springs up in winter is called a chinook.

Thus we see in an age of high civilization and universal knowledge the vicissitudes of written words. Within thirty years "chinook" has been turned "end for end."

The changes perpetually going on in the spelling of words are paralleled by equally radical changes in their meanings. The movement for simplified spelling represents the modern scientific, economical, labor-saving and socialistic spirit as contrasted with the individualistic, autocratic, and arbitrary spirit of the past generations. There is no continuous per-

<sup>1</sup> See Science, 1909, 29 (n. s.): 122.